

REMARKS

Reconsideration of the application is respectfully requested for the following reasons:

1. Objection to Drawings

This objection has been addressed by amending the specification to refer to the –source– rather than “emitter” of the FET/IGBT device.

2. Claim Objections and Rejection Under 35 USC §112, 2nd Paragraph

The objections set forth in item 2 on page 2 of the Official Action, and the rejection under 35 USC §112, 2nd Paragraph have been addressed by complete re-writing the claims to be in proper U.S. format. In addition, the specification and abstract have been amended to correct numerous grammatical and idiomatic errors.

Having thus overcome each of the objections and non-prior art rejections made in the Official Action, withdrawal of the objection and rejections, and early and favorable action on the merits, is requested.

Respectfully submitted,

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Ser. No. 09/964,323

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Group Art Unit 2878

TITLE: TRANSISTOR PHOTOELECTRIC CONVERSION DRIVE CIRCUIT

BACKGROUND OF THE INVENTION

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(a) Field of the Invention

The present invention relates to an photoelectric conversion drive circuit of a transistor, and more particularly, to one that ~~comprised of~~ includes a matching electric energy driven light emission device, e.g. an LED, a light bulb, or any other type of photoelectric conversion light emission device or natural light source in the environment; ~~an a~~ a device coupled to the matching photoelectric conversion light emission device, such as ~~an the~~ the electricity storage device of ~~an photo to electric energy a photoelectric~~ a photoelectric crystal or a non-crystal system for causing the light emission device to emit light; and a voltage type drive electric energy photoelectric effect device that generates micro-current when subject to light, for transmission to a high input resistance type of transistor, such as a micro or power type metal-oxide-silicon field effect transistor (MOSFET), ~~or~~ insulated gate bi-carrier bipolar transistor (IGBT), or other high input resistance transistor, or a gate and emitter source of a modulus-high input resistance transistor module for driven conduction to cause the transistor or module to conduct. Meanwhile, ~~a drive electric energy of a positive voltage is and to simultaneously used to supply electric energy for storage by a circuit device of slave type of negative voltage circuit device so that upon cutting cut off, a negative voltage is generated to for input to the gate and emitter source of one or more than one high resistance transistors for facilitating the cut-off.~~

25 (b) Description of the Prior Art:

A high input resistance transistor such as a metal-oxide-silicon field effect transistor (MOSFET), ~~or~~ an insulated gate bi-carrier bipolar transistor IGBT, or any other type of high input resistance transistor or ~~modulus-module is known as a solid-state transistor device voltage with having~~ its operation controlled by a drive voltage that has

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been developed only in recent years. In addition to functioning as a solid-state high power switch, the high input resistance transistor ~~is convenient to~~ may conveniently be applied in a micro-electronic logic operation or data memory storage circuit device, ~~or a~~ detection circuit device, or other circuits. However, the input end for controlling the operation of the high input resistance transistor, e.g., a MOSFET, IGBT or other types of high input resistance transistor or ~~modulus module~~, is of high resistance type. The matching current of its drive signal is very small (approaching zero). Since the drive voltage must reach a pre-set value to ensure of normal operation, a larger resistance is observed between ~~collector and emitter~~ drain and source if the voltage between the gate and ~~emitter~~ source gets too low, and thus the high resistance input transistor may ~~get be~~ burnt out due to increased thermal loss. Such a disadvantage ~~makes limits~~ application of the transistor ~~be somehow limited when applied in the occasion with in~~ applications involving an occasionally lower input voltage. ~~A drawing of working characteristics of the high input resistance transistor using an IGBT as example is~~ attached to this application. Preferably, the drive signal for the IGBT should not be less than 12V.

SUMMARY OF THE INVENTION

The primary purpose of the present invention is to provide a drive circuit to drive for a metal-oxide-silicon field effect transistor (MOSFET), ~~or an insulated gate bi-carrier bipolar~~ transistor (IGBT), or any other type of high input resistance transistor, ~~by having in which~~ an electric energy driven light emission device or an environmental light source is used to excite a device coupled to the photoelectric conversion light emission device or environmental light source, and cause the light emission device or light source to generate electric energy of positive voltage; and to ~~generate supply~~ a negative voltage to the gate and emitter of one or more than one high resistance transistor to facilitate cutting off of the at least one transistor without a sudden drop in the gate to source voltage.

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BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block ~~chart~~ diagram showing a basic circuit of a photoelectric conversion transistor drive circuit ~~of according to the present invention of a transistor,~~

5 Fig. 2 is a view showing ~~that the present invention is in parallel with induction to form a slave negative voltage supply circuit~~ including a parallel-connected inductor,

Fig. 3 is a view showing ~~that the present invention is in parallel with induction and capacitors to form a slave negative voltage supply circuit~~ including a parallel-connected inductor and capacitor,

10 Fig. 4 is a view showing ~~that the present invention is in series with induction to form a slave negative voltage supply circuit~~ including a series-connected inductor,

Fig. 5 is a view showing ~~that the present invention is in series with induction and capacitors in parallel to form a slave negative voltage supply circuit,~~

15 Fig. 6 is a view showing ~~that the present invention is in series with resistance and secondary battery to form a slave negative voltage supply circuit~~ including a series-connected resistance and secondary battery,

Fig. 7 is a view showing ~~that the present invention is in series with a series-connected~~ zener diode and secondary battery arranged to form a slave negative voltage supply circuit,

20 Fig. 8 is a view showing ~~that the present invention is in parallel with a parallel-connected~~ pressure effect system of having a pre-stressed structure and arranged to form a slave negative voltage supply circuit,

25 Fig. 9 is a view showing ~~that a slave negative voltage supply circuit is comprised of the present invention and an~~ including a series-connected, inverse polarity photoelectric conversion device in series of inverse polarity with drive signals,

Fig. 10 is a view showing ~~that a slave negative voltage supply circuit comprised of having connected the output from a device coupled to a~~ in which the photoelectric conversion light emission device of the present invention is connected in series with a

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zener diode and ~~capacitors~~ a capacitor,

Fig. 11 is a view showing a circuit ~~wherein the present invention~~ provided with a negative voltage storage device that simultaneously excites two photoelectric conversion ~~device~~ devices connected in series of inverse polarity coupled to the electric
5 light emission device from a signal source,

Fig. 12 is a view showing another circuit ~~wherein the present invention~~ provided with a negative voltage storage device that simultaneously excites two photoelectric conversion device connected in series of inverse polarity coupled to the electric light emission device from a signal source,

10 Fig. 13 is a view showing a circuit ~~wherein the present invention is adapted by means of including~~ two electric energy driven light emission ~~device~~ devices ~~driven by electric energy polarity selection connected~~ to two photoelectric conversion device connected in parallel ~~of~~ with inverse polarity,

15 Fig. 14 is a view showing a circuit wherein two individual electric energy driven light emission devices are used ~~by the present invention~~ to control the operation of two photoelectric conversion devices connected in parallel ~~of~~ with inverse polarity,

Fig. 15 is a view showing another circuit wherein two individual electric energy driven light emission device are used ~~by the present invention~~ to control the operation of two photoelectric conversion ~~device~~ devices connected in parallel ~~of~~ with inverse
20 polarity,

Fig. 16 is a ~~first~~ preferred embodiment of the present invention comprised of a constant negative electric energy device,

Fig. 17 is a ~~second~~ preferred embodiment of the present invention also comprised of a constant negative electric energy device, and

25 Fig. 18 is a ~~third~~ another preferred embodiment of the present invention comprised of a constant negative electric energy device.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

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The present invention relates to an photoelectric conversion drive circuit of a transistor, and more particularly, to one that comprised of a matching electric energy driven light emission device, e.g. an LED, a light bulb, any other type of photoelectric conversion light emission device or natural light source in the environment; an device coupled to the matching photoelectric conversion light emission device, such as an electricity storage device of an photo to electric energy crystal or a non-crystal system; and a voltage type drive electric energy that generates micro-current when subject to light, for transmission to high input resistance type of transistor, such as a micro or power type metal-oxide-silicon field effect transistor (MOSFET) or insulated gate bi-carrier transistor (IGBT) or other high input resistance transistor or a gate and emitter of a modulus for driven conduction. Meanwhile, a drive electric energy of a positive voltage is used to supply electric energy for storage by a circuit device of slave type of negative voltage so that upon cutting off, negative voltage is generated to input to gate and emitter of one or more than one high resistance transistors for facilitating the cut-off.

Fig. 1 is a block chart diagram showing a basic circuit of a photoelectric conversion drive circuit of for a transistor of according to the present invention. The photoelectric conversion drive circuit illustrated in Fig. 1 is essentially comprised of:

- a high input resistance transistor Q101: comprised made up of one or more than one various types type of high input resistance transistor devices, including one-unit one-polarity single unit, single polarity devices or devices made up of two units inversely connected in parallel, or a bridge type modulus-high input resistance transistor such as an active device comprised of a metal-oxide-silicon field effect transistor (MOSFET) or an insulated gate bi-carrier bipolar bipolar transistor (IGBT), or other high input resistance transistor or, modulus, transistor module, or gate, or constitutes a logic operation or data memory storage system, or detection circuit device, or constitutes other circuit that is driven by receiving electric energy drive signal of a positive voltage drive signal, or one or more than one an photoelectric conversion devices PE101 is

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~~provided for joint or individual matching as maybe required to drive the high input resistance transistor Q101;~~

- a photoelectric conversion device PE101: ~~comprised~~ made up of a crystal or non-crystal system photo device that generates electric energy output when subject to light, or ~~of other type of photoelectric conversion device~~ arranged to receive photo energy from an environmental light source or an electric energy driven light emission device EL101, and then convert the photo energy is ~~converted into a minimum drive voltage required by the high input resistance transistor Q101 to drive the high input resistance transistor Q101;~~ the electric energy driven light emission device EL101 ~~comprised of including one or more than one light emission emitting diodes (LEDs), electric bulb-bulbs, or any other type of photoelectric conversion device is matched to the an-photoelectric conversion device PE101 in such a way that the photo energy outputted by the light emission device generates the minimum drive voltage required by the photoelectric conversion device PE101; one or more than one of the electric energy driven light emission devices EL101 are being used to drive one or more that one the photoelectric conversion device PE101, either individually or jointly; or one or more than one electric energy driven light emission device EL101 are used to jointly drive the photoelectric conversion device PE101; or two or more than two electric energy driven light emission devices EL101 are used to respectively drive the photoelectric conversion device PE101; or two or more than two electric energy driven light emission devices EL101 are used to simultaneously drive two or more than two photoelectric conversion devices PE101; and one or more than one the electric energy driven light emission devices EL101 may be provided or not provided at all depending on the requirements of the circuit;~~

- a slave negative voltage supply circuit-device VB101: ~~comprised of solid status~~ a solid state or mechanic-electronic-electro-mechanical device to provide a negative voltage between the gate and source of the transistor upon cutting off for positive voltage transmission to the control gate and emitter of the high input resistance transistor Q101,

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for facilitating ~~the cutoff to be executed by~~ of the high input resistance transistor Q101;
wherein upon the delivery of the positive voltage electric energy signal controlling the
drive, or when the photoelectric conversion device PE101 receives the photo energy
emitted from the electric energy driven light emission device EL101 or from the
5 environment to generate positive a voltage to drive the high input resistance transistor
Q101, the slave negative voltage supply circuit device VB101 executes storage of
negative voltage ~~at the same by means of~~ utilizing the electric energy of the inputted
positive voltage signal so that when the positive voltage signal being transmitted
~~transmitting~~ to the high input resistance transistor Q101 is interrupted, the slave
10 negative voltage supply circuit device VB101 inputs negative voltage to the controlling
gate and ~~emitter~~ source of the high input resistance transistor Q101 to facilitate cut-off
transition; the negative voltage electric energy of the slave negative voltage supply
circuit device VB101 ~~may come from~~ being provided by ~~a photoelectric conversion~~
~~device includes that from the~~ photoelectric conversion devices PE101, ~~or by an~~
15 independently provided photoelectric conversion device PE102, or ~~that by~~ positive
voltage electric energy from ~~other~~ another drive signal source; and the negative voltage
storage is ~~characterized by a mechanic-electronic~~ being in the form of an electro-
mechanical device, an inductive device, a ~~capacity~~ capacitive device, a (dis)chargeable
secondary battery, ~~or a super capacitor, or any other type of electricity storage device to~~
20 ~~store electric energy of~~ for storing the positive voltage electric energy required for
driving the high input resistance transistor Q101;

- a ~~loading~~ load device LD101; ~~includes in the form of~~ a load ~~generating~~ arranged to
convert electrical energy into mechanical energy, ~~photo light, thermal or heat, or a load~~
arranged to provide an electrochemical effect ~~by inputting electric energy, or any other~~
25 power load comprised of resistive, ~~capacity~~ capacitive, inductive ~~load elements, or a~~
transistor, ~~a~~ or diode or any other ~~solid status or mechanic-electronics~~ solid state or
electro-mechanical load device, ~~or any circuit load functioning for~~ having the function of
post amplification, ~~or any load for signal transmission, or any load for data storage, or~~

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read-out, or elimination, or operation, or any load functioning as a detection circuit device, or any other circuit load to be subject to the control by the high input resistance transistor Q101.

By combining ~~these~~ the devices disclosed above, photoelectric conversion
5 ~~devices~~ device PE101 ~~to~~ will generate a drive voltage under normal conditions of being
subject to light ~~in parallel~~, while the slave negative voltage supply circuit device VB101
~~and the electric energy driven light emission device EL101 which can be coupled to the~~
~~photoelectric conversion device PE101 such as the light emission diode (LED) or~~
~~electric bulb is~~, provided between the gate and the emitter ~~from~~ source of a high input
10 resistance transistor such as a micro or power type metal-oxide-silicon field effect
transistor (MOSFET), ~~or an insulated gate bi-carrier~~ bipolar transistor (IGBT), or other
type of high input resistance transistor or ~~modulus~~ module, stores electric energy to
provide a cut-off voltage when photoelectric conversion by the conversion device PE101
ceases so that when the electric energy driven light emission device EL101 emits the
15 ~~light, or when the photoelectric conversion device PE101 is excited by the~~
~~environmental light source, a relative drive voltage signal is generated to drive the high~~
~~input resistance transistor Q101.~~

The structural configuration of the photoelectric conversion drive circuit of the transistor is described as follows:

- 20 (1) Depending on ~~the~~ structural requirements, the electric energy driven light
emission device EL101, the photoelectric conversion device PE101 and the
slave negative voltage supply circuit device VB101 may be of individual
structure, or mutually coupled, or partially or generally coupled to form a sealed
configuration;
- 25 (2) Depending on ~~the~~ structural requirements, the electric energy driven light
emission device EL101, the photoelectric conversion device PE101 and the
slave negative voltage supply circuit device VB101 may be partially or generally
separately provided or packed into a ~~modulus~~ module with the high input

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resistance transistor Q101;

(3) Each and all related circuit devices may be directly connected or connected via an I/C or a PCB to form an open structure or a hybrid structure;

(4) A drive source for the energy driven light emission device EL101 referred in subparagraphs (1) , (2) and (3) may be of DC or AC source to drive the a bulb, ~~or comprised of DC electric energy driven a DC source to drive a~~ light emission diode (LED), or a laser light source or other electric energy excited electric energy driven light emission device, or may be substituted with a natural light source from the environment may be substituted.

The ~~essential composition of the~~ slave negative voltage supply circuit device VB101 provided in the photoelectric conversion drive circuit of the transistor, ~~is characterized by that with~~ may be a combination of ~~mechanical-electronic-an electro-mechanical~~ device or a solid-state device, with various types of electric energy of positive voltage signal-functioning as the input drive for the high input resistance transistor Q101 and ~~are~~ at the same time being transferred to and stored in the slave negative voltage supply circuit device VB101 so to function as a negative voltage source ~~in helping to assist in~~ cutoff when the high input resistance transistor Q101 is cut off; ~~it is also characterized by that by taking.~~ The negative voltage supply circuit device VB101 takes advantage of the photo energy generated when the electric energy driven light emission device ~~is subject to a light for emitting the~~ emits light, and the photoelectric conversion device PE101 or PE102 is excited to generate the positive voltage electric energy required to drive the high input resistance transistor-~~while,~~ the positive voltage electric energy ~~is being~~ transferred to and stored in the slave negative voltage supply circuit device VB101 so to function as ~~the a~~ negative voltage source to help energy transformation when the high input resistance transistor Q101 is cut off; ~~whereas the circuit structure for the formation of the.~~ The slave negative voltage supply circuit device VB101 ~~is in great number~~ can take a variety of forms, and the following preferred embodiments are given only ~~for references to prove the feasibility of the slave~~

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negative voltage supply circuit device VB101, and do not in any way limit the scope of its composition as examples and not intended to be limiting:

- a. As illustrated in Fig. 2, the slave negative voltage supply circuit is comprised of ~~the present invention in parallel with induction~~ a parallel-connected inductor.
5 ~~Within, The~~ input end of the high input resistance transistor Q101 is used to connect an induction L101 in parallel so that when an interruption occurs in the external signal source or the positive voltage signal source used to drive the high input resistance transistor Q101 and supplied from the photoelectric conversion device PE101, ~~with selected output voltage coupled as controlled by the electric~~
10 ~~energy driven light emission device EL101 is interrupted~~, the induction L101 then generates a an inverse negative voltage and supplies it to the input end of the high input resistance transistor Q101 to improve its cutoff characteristics;
- b. Fig. 3 shows that a slave negative voltage supply circuit comprised of the present invention is ~~connected in parallel with induction~~ includes a parallel-
15 connected inductor and capacitor. ~~Wherein, the~~ The input end of the high resistance transistor Q101 is connected in parallel with ~~an~~ induction L101 and capacitors C101 so that when an external signal source or the positive voltage signal source ~~used to drive the high input resistance transistor Q101~~ supplied from the photoelectric conversion device PE101, ~~with selected output voltage~~
20 ~~coupled as controlled by the electric energy driven light emission device EL101,~~ is interrupted, the induction L101 and the capacitor C101 connected in parallel are used to generate an inverse negative voltage and supply it to the input end of the high resistance transistor Q101 to improve its cutoff characteristics;
- c. Fig. 4 shows ~~that a~~ slave negative voltage supply circuit ~~comprised of the~~
25 ~~present invention is connected in series with an~~ that includes a series-connected induction. ~~Within, the~~ The induction L101 is connected in series between the input of the high input resistance transistor Q101 and ~~a signal~~ the source of positive drive ~~positive~~ voltage so that when an external signal source or the

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positive voltage signal source used to drive the high input resistance transistor Q101 supplied from the photoelectric conversion device PE101, with selected output voltage coupled as controlled by the electric energy driven light emission device EL101 is interrupted, the induction L101 is connected in series between the signal source of drive positive voltage and the high input resistance transistor Q101 generates an inverse negative voltage and supplies it to the input end of the high input resistance transistor Q101 to improve its cut off characteristics, and a secondary resistance R500 may be being optionally connected in parallel with both ends of the photoelectric conversion device PE101 as required to provide a loop for the inverse negative voltage;

d. As illustrated in Fig. 5, a slave negative voltage the present invention is connected in series with including a series-connected parallel combination of an induction L101 and capacitors capacitor C101 connected in parallel so that when an external signal source or the positive voltage signal source used to drive the high input resistance transistor Q101 supplied from the photoelectric conversion device PE101, with selected output voltage coupled as controlled by the electric energy driven light emission device EL101, is interrupted, a parallel harmonic oscillation oscillator is formed comprising of the induction inductor L101 and the capacitors capacitor C101 in parallel is connected in series between the high input resistance transistor Q101 and the signal source of drive positive voltage, and an inverse negative voltage is generated and supplied to the input end of the high input resistance transistor Q101 to improve its cutoff characteristics, while a secondary resistance R500 may be connected as required in parallel with both ends of the photoelectric conversion device PE101 to provide a loop of for the inverse negative voltage;

e. Fig. 6 shows that a slave negative voltage supply circuit is comprised of the present invention in series with including a series-connected resistance and a secondary battery system. Within, a combination of a resistance R400 and a

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secondary electricity storage device ESD101 in parallel is comprised of having
the ~~The~~ secondary battery system ESD101 is comprised of ~~the~~ a capacitor or the
a secondary (dis)-chargeable battery and the resistance R400 in parallel, ~~to be~~
and is connected in series between the drive signal source and the input of the
5 high input resistance transistor Q101, ~~and the~~ The secondary resistance R500
is connected in parallel with either side of a connection of the combination of the
drive signal source and the resistance R400 ~~connected in parallel with the~~
~~secondary electricity storage device ESD101~~ and another end ~~from of~~ the signal
source of the drive positive voltage so ~~to have~~ as to permit the drive signal
10 source or the photoelectric conversion device PE101 ~~with the selected output~~
~~voltage coupled as controlled by the electric energy driven light emission device~~
~~EL101 to generate electricity when subject to light, and thus to generate a~~
positive voltage to drive the high input resistance transistor Q101; ~~and in addition~~
~~to driving the high input resistance transistor Q101, the positive voltage also~~
15 ~~forms forming a voltage drop to across~~ the resistance R400 ~~provided in the~~
~~combination of the resistance R400 and the secondary electricity storage device~~
~~ESD101 connected in parallel, so to charge a the negative voltage into both~~
ends of the secondary electricity storage device ESD101; ~~furthermore, wherein~~
when the ~~signal source of the~~ positive voltage is interrupted, the negative voltage
20 stored in the secondary electricity storage device ESD101 forms, through the
secondary resistance R500, a negative voltage and supplies it to the input end of
the high input resistance transistor Q101 to improve its cutoff characteristics;

- f. Fig. 7 shows ~~that that~~ a slave negative voltage supply circuit ~~is~~ comprised of
having the present invention connected in series with a combination of a zener
25 diode and a secondary electricity storage device in parallel. ~~Within, a~~ The
~~combination of a resistance and a secondary electricity storage device in parallel~~
~~is comprised of having the~~ secondary electricity storage device ESD101 is
comprised of ~~the~~ a capacitor or ~~the~~ a secondary (dis)chargeable battery and a

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parallel combination of a zener diode ZD101 and a secondary electricity storage device ESD101, ~~in parallel to be~~ which is connected in series between the drive signal source and the input of the high input resistance transistor Q101, and secondary ~~resistance-resistances~~ R500 and R500' are respectively connected in parallel with both ends of the combination of the zener diode ZD101 ~~in parallel~~ and the drive signal source, so to have the drive signal source or the photoelectric conversion device PE101, ~~with the selected output voltage coupled~~ as controlled by the electric energy driven light emission device EL101, ~~to~~ generate electricity when subject to light, thus ~~to generate~~ generating a positive voltage to drive the high input resistance transistor Q101; and in addition to driving the high input resistance transistor Q101, the zener voltage of the zener diode ZD101 is used to form a voltage drop at both ends of the secondary electricity device ESD101 so to charge the negative voltage into both ends of the secondary electricity storage device ESD101. ~~;~~ Furthermore, when ~~When~~ the signal source of the positive voltage is interrupted, the negative voltage stored in the secondary electricity storage device ESD101 forms, through the secondary ~~resistance-resistances~~ R500 and R500', a negative voltage and supplies it to the input end of the high input resistance transistor Q101 to improve its cutoff characteristics.

g. Fig. 8 shows that a slave negative voltage supply circuit ~~is comprised of the present invention connected in parallel with a~~ that includes a parallel-connected pressure effect device of a pre-stressed structure. ~~Within, a~~ The pressure effect device PZ101 ~~of pre-stressed structure~~ is connected in parallel between the drive signal source and the input end of the high input resistance transistor, ~~the pressure effect device includes and includes~~ any device with a pressure effect ~~and that~~ is pre-compressed by means of the pre-stressed structure so that it is normally under negative voltage status ~~when transmitted to the high input resistance transistor Q101, and while~~ the light emission device EL101 ~~from the~~

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drive signal source is used to control the operation of the photoelectric conversion device PE101 with selected voltage coupled to it to generate electricity when subject to light for generating a positive voltage to and drive the high input resistance transistor Q101; meanwhile, by taking advantage of such the pressure effect, the pressure effect device PZ101 indicates its transformation in opposite opposition to the pre-stressed direction so that when the positive voltage drive signal is interrupted, the pressure effect device PZ101 ~~indicates a status of~~ supplies a negative voltage against to the input end of the high input resistance transistor Q101 by pre-stress restoration for improving its cutoff characteristics;

- h. Fig. 9 shows that a slave negative voltage supply circuit is comprised of the ~~present invention and a~~ an inverse series-connected photoelectric conversion device ~~connected in series of inverse polarity with~~ having a polarity opposite to that of the drive signal. ~~Within, the~~ More specifically, the photoelectric conversion device PE101 with selected output voltage is connected in series of inverse polarity between the drive signal source and the input of the high input resistance transistor, and the secondary electricity storage device ESD101 comprised of a capacitor or a secondary (dis) chargeable battery is connected in parallel with both ends of the photoelectric conversion device, ~~or a~~ A secondary resistance R600 may be further connected in parallel as required while the electric energy driven light emission device EL101 is coupled, in parallel with the input end of the drive signal, ~~is coupled~~ to the photoelectric conversion device PE101. In addition to driving the high input resistance transistor Q101, the input of electric energy from the positive voltage signal also causes the electric energy driven light emission device EL101 to emit the light at the same time so as to excite the photoelectric conversion device PE101 for generating ~~output of a~~ negative voltage output and ~~charging charge~~ the secondary electricity storage device ESD101, provided that upon the electric energy of the positive voltage

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signal being interrupted, the secondary electricity storage device ESD101 delivers a negative voltage into the input end of the high input resistance transistor Q101 to improve its cutoff characteristics;

- i. Fig. 10 shows that a slave negative voltage circuit is comprised of a zener diode and capacitors connected in series at the output end of the photoelectric conversion device coupled to the electric energy driven light emission device of the present invention. ~~Within, the~~ The drive signal source is used to drive the electric energy driven light emission device EL101 to excite the photoelectric conversion device PE101 with selected output voltage coupled to the electric energy driven light emission device EL101, and a zener diode ZD101 and the secondary electricity storage device ESD101 comprised of a capacitor or a secondary (dis)chargeable battery connected in parallel with both ends of the zener diode are connected in series between the photoelectric conversion device and the input end of the high input resistance transistor Q101, so that ~~upon the a~~ positive driving voltage is generated when electric energy from an external signal source is inputted, or when the photoelectric conversion device PE101 coupled as controlled by the electric energy driven light emission device EL101 generates electricity, ~~for being subject to the light to~~ drive the high input resistance transistor Q101 through the zener diode ZD101, and to charge the secondary electricity device ESD101 in parallel with both ends of the zener diode ZD101; ~~when~~ When the signal of positive voltage is interrupted, the secondary electricity device ESD101 ~~indicates input of~~ inputs a negative voltage to the input end of the high input resistance transistor Q101 to improve its cutoff characteristics; ~~if~~ If required, the secondary resistance R500 ~~maybe~~ may be connected in parallel with the output end of the photoelectric conversion device;
- j. Fig. 11 shows ~~that an~~ an embodiment in which the electric energy driven light emission device provided at the signal source of the present invention is used to simultaneously excite two photoelectric conversion devices connected in series

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of ~~with~~ inverse polarity ~~that are and~~ coupled to the electric energy driven light emission device while an electricity storage device circuit for negative voltage is also provided. ~~Within, the~~ The drive signal source is used to drive the electric energy driven light emission device EL101 to excite the two photoelectric conversion devices PE101 and PE102 of having different values of rated output voltage ~~connected in series of inverse polarity and indicating input polarity of negative voltage with the input end of the high input resistance transistor Q101 in the photo energy driven light emission device, the secondary electricity storage device ESD101 being comprised of capacitors or the a secondary (dis)~~ chargeable battery ~~is connected in parallel with both output ends of the photoelectric conversion device PE102 having the lower rated output voltage; such that upon the input of electric energy from the positive voltage signal, the electric energy driven light emission device EL101 is excited to emit light, and both of the two photoelectric conversion devices PE101 containing higher rated output voltage and PE102 having the lower rated output voltage that are connected in series in inverse direction and coupled to the electric energy driven light emission device EL101 are excited to generate electricity at the same time; meanwhile~~ Meanwhile, the circuit indicates supplies, at the input end of the high input resistance transistor Q101, a positive voltage input of the voltage difference between the two photoelectric conversion devices PE101 and PE102 so to ~~conduct cause~~ the high input resistance transistor Q101 to conduct and to execute negative voltage charging on the secondary electricity storage device ESD101, ~~then. Then,~~ Then, the electric energy is outputted through the secondary resistance R500 to the high input resistance transistor Q101 to facilitate its cut-off conduction; ~~furthermore, the~~ The secondary resistance R500' may be connected in parallel with both ends of the secondary electricity storage device ESD101 as required by the circuit;

k. Fig. 12 shows another example of ~~the using an~~ electric energy driven light

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emission device provided at the signal source of the present invention ~~is used to~~
simultaneously excite two photoelectric conversion devices connected in series
of inverse polarity ~~that are~~ and coupled to the electric energy driven light
emission device while an electricity storage device circuit for negative voltage is
5 also provided. ~~Within, the~~ The drive signal source is used to drive the electric
energy driven light emission device EL101 to excite the two photoelectric
conversion devices PE101 and PE102 with selected output voltage connected in
series of inverse polarity ~~and indicating input polarity of negative voltage with and~~
arranged to supply the input end of the high input resistance transistor Q101 in
10 the photo energy driven light emission device with a negative voltage, ~~the a~~
secondary electricity storage device ESD101 being comprised of capacitors or
~~the a~~ secondary (dis)chargeable battery is connected in parallel with both output
ends of the photoelectric conversion device PE102 and is further connected in
parallel with the zener diode ZD101 having its zener voltage lower than the rated
15 voltage of the photoelectric conversion device PE101. ~~upon~~ Upon the input of
electric energy from the positive voltage signal, the electric energy driven light
emission device EL101 is excited to emit light, and both of the two photoelectric
conversion devices PE101 and PE102 that are connected in series in inverse
direction and coupled to the electric energy driven light emission device EL101
20 are excited to generate electricity at the same time; ~~meanwhile~~. Meanwhile, the
circuit ~~indicates~~ provides at the input end of the high input resistance transistor
Q101 a positive voltage input through the zener diode ZD101 to ~~conduct~~ cause
conduction of the high input resistance transistor Q101 and to execute negative
voltage charging ~~on~~ of the secondary electricity storage device ESD101
25 connected in parallel with both ends of the zener diode. ~~when~~ When the electric
energy from the positive voltage signal is interrupted and the electric energy
driven light emission device EL101 stops light emission, the electric energy of
negative voltage from the secondary electricity storage device ESD101 is

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outputted through the secondary resistance R500 connected in parallel with both ends of the photoelectric conversion device PE101 to the high input resistance transistor Q101 to facilitate its cut-off ~~conduction~~;

- 1 . As illustrated in Fig. 13, a circuit of the present invention is comprised of two
5 electric energy driven light emission devices EL101 and EL102 ~~driven by~~
~~selected electric energy polarity adapted with and~~ two photoelectric conversion
devices PE101, PE102 connected in parallel of with inverse polarity. ~~Within, the~~
10 The two electric energy driven light emission devices EL101 and EL102 are
~~driven by 2-way a two-way~~ drive signal source, and the two photoelectric
conversion devices PE101 and PE102 with selected output voltage are
connected in parallel of with inverse polarity and coupled to the two electric
energy driven light emission devices EL101 and EL102 ~~are used in order to~~
15 ~~output a positive voltage to the input end of the high input resistance transistor~~
~~Q101. When the input signal source relates to is a positive conduction signal to~~
~~drive that causes~~ the positive conduction electric energy driven light emission
device EL101 to emit ~~the light light~~, ~~thus to cause the photoelectric conversion~~
device PE101 coupled to it ~~also excited for light emission to generate~~ generates
electric energy of positive polarity to drive the high input resistance transistor
Q101 ~~to be conducted~~ conduct; ~~when~~ When the positive signal from the input
20 signal source is cut off and turned into a negative signal, the electric energy of
positive polarity outputted to the high resistance transistor is cut off ~~while the~~
~~other unit for cutoff~~, i.e. the electric energy driven light emission device EL102
emitting the light in inverse direction emits ~~the light~~, ~~thus~~ to excite the
photoelectric conversion device PE102 coupled to it for emitting ~~the light to~~
25 ~~generate electric energy of negative polarity outputting, which is output to the~~
input end of the high input resistance transistor Q101 for improving its cutoff
characteristics;

- m. Fig. 14 shows ~~that~~ a circuit comprised of two individual electric energy driven

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light emission devices ~~is~~ used to control the operation of two photoelectric conversion devices connected in parallel ~~of~~ with inverse polarity. ~~Within, the~~ The two individual electric energy driven light emission devices EL101 and EL102 are driven by a ~~2-way~~ two-way drive signal source, and the two photoelectric conversion devices PE101 and PE102 are provided with a selected output voltage and connected in parallel ~~of~~ with inverse polarity ~~are used to for output to where between~~ input ends of the high input resistance transistor Q101. When the input signal source ~~relates to~~ provides a positive conduction signal to drive its matching electric energy driven light emission device EL101 ~~to be excited for emitting the light~~, the photoelectric conversion device PE101 coupled to it generates electricity ~~from receiving the light to generate electric energy of~~ positive polarity to drive the high input resistance transistor Q101 ~~for it to turn on to be conducted; when~~. When the positive signal from the input signal source is cut off and turns into a negative signal, the electric energy of positive polarity outputting to the high input resistance transistor Q101 is also cut off while the other photoelectric conversion device PE102 used also for cutoff starts to emit ~~the light to generate electric energy of negative polarity for outputting to the input end of the high input resistance transistor Q101 to improve its cutoff characteristics;~~

n. Fig. 15 shows ~~that a circuit of~~ according to the present invention that controls t/he operation of two photoelectric conversion devices ~~indicating of~~ inverse polarity ~~with using~~ two individual light emission devices driven by electric energy. ~~Within, The~~ The two respectively provided electric energy driven light emission devices EL101 and EL102 are driven by a two-way drive signal source, and two photoelectric conversion devices PE101 and PE102 with selected output voltage are connected in series ~~of~~ with inverse polarity and coupled to the two individual electric energy driven light emission devices EL101 and EL102 ~~are used to output to where between the input ends of the high input resistance transistor~~

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Q101. When the input signal source ~~relates to~~ provides a positive conduction signal to drive its matching electric energy driven light emission device EL101 ~~to be excited for emitting the light~~, the photoelectric conversion device PE101 coupled to it generates ~~electricity from receiving the light to generate~~ electric energy of positive polarity to drive the high input resistance transistor Q101 ~~for it to turn to be conducted~~ to conduct; ~~when~~ When the positive signal from the input signal source is cut off and turns into a negative signal, the electric energy of positive polarity outputting to the high input resistance transistor Q101 is also cut off while the other photoelectric conversion device EL102 used ~~also~~ for cutoff starts to emit ~~the~~ light to generate electric energy of negative polarity for outputting to the input end of the high input resistance transistor Q101 to improve its cutoff characteristics. The individual output end of the two photoelectric conversion devices connected in series of inverse polarity may be respectively connected in parallel with ~~the resistance~~ resistances R500 and R500' as required;

- o. Fig. 16 shows ~~a first~~ another preferred embodiment of the present invention provided with a source of negative polarity. ~~Within, a~~ A fixed source or a drive signal is used to drive an electric energy driven light emission device EL102 to generate photo energy for exciting the photoelectric conversion device PE102 ~~for generating and generate~~ electric energy of negative polarity that is coupled to the electric energy driven light emission device EL102, ~~while the drive signal source is directly inputted or drives to control the operation of the electric energy driven light emission device EL101 to relatively and thereby generate photo energy for exciting the photoelectric conversion device PE101 coupled to it and provided for generating to generate~~ electric energy of positive polarity, ~~then~~. Then, the photo energy is further outputted to the input end of the high input resistance transistor Q101, with both input ends of the high input resistance transistor Q101 connected in parallel and

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further connected in series with a secondary resistance R700 and another resistance R700'; ~~and the~~ The photoelectric conversion device PE102 provided for generating electric energy of negative polarity ~~indicates~~ has an inverse polarity ~~to be connected in parallel with connection to the~~ secondary resistance R700' for constantly ~~indicating~~ supplying electric energy of negative polarity to the input end of the high input resistance transistor Q101. When the drive signal source is interrupted, the electric energy of positive polarity outputted to the high input resistance transistor Q101 is also cut off, and the electric energy of negative polarity outputted from the photoelectric conversion device PE102 is conducted to the high input resistance transistor Q101 to improve its cutoff characteristics; ~~the~~ The -fixed source may come from a main power line, ~~or a~~ dedicated secondary power source, or a secondary source shared by ~~other~~ another source circuit;

- p. Fig. 17 shows ~~a second~~ another preferred embodiment of the present invention provided with a source of negative polarity. ~~Within, a~~ A fixed source or a drive signal is used to drive an electric energy driven light emission device EL102 to generate photo energy for exciting the photoelectric conversion device PE102 ~~for generating~~ to generate electric energy of negative polarity that is coupled to the electric energy driven light emission device EL102, while the drive signal ~~source~~ is directly inputted ~~or drives~~ to control the operation of the electric energy driven light emission device EL101 ~~to relatively~~ and generate photo energy for exciting the photoelectric conversion device PE101 coupled to it and ~~provided~~ providing for generating electric energy of positive polarity. ~~The, then the~~ photo energy is further outputted to the input end of the high input resistance transistor Q101 with both input ends of the high input resistance transistor Q101 connected in parallel with a circuit comprised of a secondary resistance R700 and the secondary electricity device ESD101 connected in series; ~~and the~~ photoelectric conversion device PE102 provided for generating electric energy of negative

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polarity ~~indicates inverse polarity to be being~~ connected in parallel with the secondary electricity storage device ESD101 for constantly ~~indicating~~ supplying electric energy of negative polarity to the input end of the high input resistance transistor Q101. When the drive signal source is interrupted, the electric energy of positive polarity outputted to the high input resistance transistor Q101 is also cut off, and the electric energy of negative polarity outputted from the photoelectric conversion device PE102 is conducted to the high input resistance transistor Q101 to improve its cutoff characteristics; ~~the~~ The fixed source may come from a main power line, ~~or~~ a dedicated secondary power source, or a secondary source shared by ~~other~~ another source circuit, and a secondary resistance R700' may be ~~or may not be respectively provided to at both~~ ends of the photoelectric conversion device PE102; and

q. Fig. 18 shows ~~a third~~ yet another preferred embodiment of the ~~presentation invention that is~~ provided with a power source of negative polarity. ~~Within, a A~~ fixed source or a drive signal is used to drive an electric energy driven light emission device EL102 to generate photo energy for exciting the photoelectric conversion device PE102 ~~for generating and generate~~ electric energy of negative polarity that is coupled to the electric energy driven light emission device EL102, while the drive signal source is directly inputted or ~~drives~~ driven to control the operation of the electric energy driven light emission device EL101 to relatively generate photo energy

for exciting the photoelectric conversion device PE101 coupled to it and ~~provided for generating~~ generate electric energy of positive polarity, ~~when~~ When both output ends of the photoelectric conversion device PE101 ~~is~~ are connected in parallel with the secondary resistance R700, and then further connected in series with the photoelectric conversion device PE102 of inverse polarity and inputted to the input end of the high resistance transistor Q101, the ~~voltage of~~ rated output ~~electric energy~~ voltage of the photoelectric conversion device

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PE102 ~~provided for generating the electric energy of negative polarity is lower than the voltage of the rated output voltage of the photoelectric conversion device PE102 constant to its inputted electric energy of negative polarity without affecting the~~ and control by the drive signal over the operation of the high input resistance transistor Q101 if not affected. When the drive signal source is interrupted, the electric energy of positive polarity outputted to the high input resistance transistor Q101 is also cut off, and the electric energy of negative polarity is outputted to the high input resistance transistor Q101 to improve its cutoff characteristics; ~~the~~ The fixed source may come from a main power line, or a dedicated secondary power source, or a secondary source shared by ~~other~~ another source circuit, and a secondary resistance R700' may be ~~or may not be~~ respectively provided ~~to~~ at both ends of the photoelectric conversion device PE102.

As disclosed above, the photoelectric conversion transistor drive circuit ~~of the transistor~~ uses an electric energy driven light emission device or a natural light source from the environment as the working light source to control the operation of a photoelectric conversion device which, when coupled to ~~it~~ the light emission device, and generates a drive voltage ~~when subject to light and the operation of its adapted and charges slave negative voltage supply circuit device VB101, thus to constitute thereby providing~~ a pilot drive circuit of a high input resistance transistor, such as a micro type or power type metal-oxide-silicon field effect transistor (MOSFET), ~~or an insulated gate bi-carrier bipolar transistor (IGBT), or any other high input resistance transistor or modulus module so that a high input resistance transistor, such as a micro type or power type metal-oxide-silicon field effect transistor (MOSFET) or an insulated gate bi-carrier transistor (IGBT) or any other high input resistance transistor achieves to~~ achieve excellent control and operation either in the drive mode ~~of drive or during~~ cutoff.